A COVID-19 mathematical model of at-risk populations with non-pharmaceutical preventive measures

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This work examines a mathematical model of COVID-19 among two subgroups: low-risk and high-risk populations with two preventive measures. Those with underlying chronic diseases and the elderly (ages 60 and above) were classified as high-risk individuals and the rest as low-risk individuals. The parameter values used in this study were estimated using the available data from the Johns Hopkins University on COVID-19 for Brazil and South Africa. We evaluated the effective reproduction number for the two countries and observed how the various parameters affected the effective reproduction number. We also performed numerical simulations and analysis of the model.Susceptible and infectious populations for both low-risk and high-risk individuals were studied in detail. Results were displayed in both graphical and table forms to show the dynamics of each country being studied. We observed that non-pharmaceutical interventions by high-risk individuals significantly reduce infections among only high-risk individuals. In contrast, non-pharmaceutical interventions by low-risk individuals have a significant reduction in infections in both subgroups. Therefore, low-risk individuals' preventive actions have a considerable effect on reducing infections, even among high-risk individuals.